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OF

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— IN —

JOINT AND SPINAL DISEASES.

BY

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# IMPROVED METHODS OF THE TREATMENT IN JOINT & SPINAL DISEASES.

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VERY important improvements have of late been made in the treatment of diseases of the spine, the hip, the knee, and the ankle. So rapid and brilliant has been the advance in this department that, among the best surgeons, the treatment of joint and spinal diseases is already revolutionized, and vast numbers of cases are now easily curable, which formerly defied our utmost skill. It is to be regretted, however, that very many of these improvements are still unknown to the great mass of our profession. Even some of our most recent text-books are behind the times, and repeat the advice of ten years ago, in utter unconsciousness of any recent progress having been made.

As the information has never been given to the public in any compact and comprehensive form, there are many practitioners, who though aware of the existence of such improvements, have not been able to obtain sufficient knowledge of their details to apply them in the treatment of their patients. The mechanical difficulties to be overcome are considerable, for the apparatus cannot be purchased ready made, but must always be constructed by measure to fit the patient, making, of course, a constant tax upon the ingenuity of the surgeon; besides, the medical man, out of the cities, often has no mechanic at his command, with the skill required to execute his plans.

For these reasons, it happens that the whole country is sprinkled with cases of neglected deformity and articular disease, which have never been taken seriously under treatment, many of which are susceptible of complete cure.

The object of the present article is, to remedy this deficiency, by giving a carefully condensed and illustrated synopsis of the best modes of treatment now known. I hope to make the essential points so clear that any surgeon, who has ingenuity and access to suitable mechanics, will be able to devise and have constructed everything which the treatment requires; or if he does not wish to enter upon this branch of practice, he will at least, be made aware of the numerous cases which are now proved to be curable, and can direct the patient to some one who will take him efficiently in charge.

It being no part of my object to make a special parade of my own improvements in this branch of surgery, nor to settle the disputed authorship of those made by others, I may be excused from all controversial remarks. Suffice it to say, that the advances which have been made are the joint offspring of a number of different minds on both sides of the Atlantic.

The diseases to which the late improvements are mainly applicable are the following:—

Curvature of the Spine, (Spinal Disease,)  
Hip Disease, (Morbus Coxarius,)  
Knee Disease, (Inflammation and Caries,)  
Club-Foot, (Talipes.)

Our brief space forbids any more extended remarks upon the pathology of these diseases than will suffice to show the principle on which the treatment rests.

## SPINAL DISEASE.

Spinal distortions result from inflammation, caries, rickets, chronic contraction of muscles, paralysis, wrong habits of position in study or work, and unequal development of the muscles on the two sides by the exclusive use of one set, as, for instance, in sewing girls. Inflammation and caries usually produce the backward distortion; and the angular variety, while the remaining causes result in the lateral deformity and the curved forms. Lateral curvature, is almost always double like the letter S.

**CONSTITUTIONAL TREATMENT.** — The most important modern improvements are of a local and mechanical character, but the correction of the general health must not on that account be overlooked. Thus, if paralysis, rickets, scrofula, or any other disturbance is present, the well-known standard remedies are to be used. Some special remarks, however, are required respecting the correction of the diathesis in inflammatory cases. Inflammatory spinal disease may be divided into two stages,—first, that of simple inflammation; and the second, that of suppuration and caries. If the patient is of a very plastic diathesis, suppuration and caries occur with difficulty, if at all, and an excellent opportunity is afforded to effect a perfect cure. If, on the contrary, the diathesis at any time becomes aplastic, the inflamed vertebrae may become carious at once, after which the life of the patient is in extreme peril. It is of the utmost consequence, therefore, to maintain a uniformly plastic diathesis by proper constitutional treatment.

For the preservation or restoration of plasticity there is no medicine practically equal to the perchloride of iron. This should be given in doses of 20 to 40 drops of the muriated tincture, for an adult, every three hours. Quinine and mineral acids are also extremely valuable.

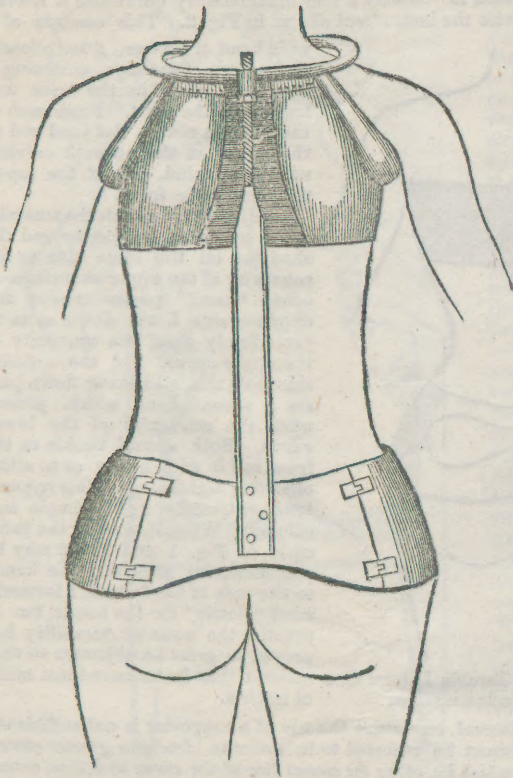
The diet should consist largely of meat, and be in all respects rich and nutritious. The patient should also spend much time out of doors, and at night sleep where every breath inhaled will be of perfectly pure and fresh air. The windows of the bedroom should be kept open in all weathers, winter and summer, for "catching cold" is not to be feared in these cases. By acting thoroughly upon these principles the diathesis can usually be rendered and kept perfectly plastic, and, if this is accomplished, caries will rarely supervene.

**LOCAL TREATMENT.** — In all inflammatory affections of the joints, the pressure of the weight of the body upon the diseased articulation is a most exasperating and injurious element in the disease. It is for this reason that the lower half of the spine, and the joints of the lower extremities far more frequently run on to destructive suppuration and caries than the upper. One of the most important discoveries ever made, therefore, is the recent one, that in treating diseases of this class, *the weight of the body must be taken off, and the tension of the muscles must be overcome, so that all pressure shall be removed from the affected articulation.*

The mechanical difficulties in the way of accomplishing this end, in diseases of the spine, have been very great, but by patient ingenuity they are now, in a great measure, overcome.



FIG. 1.



If the disease is inflammatory and is not higher than the sixth dorsal vertebra, I often make use of an apparatus upon the plan shown in Fig. 1., which is constructed in the following manner: First, take a complete cast of the patient's hips in plaster of Paris, from the small of the waist downward to two inches below the *trochanter major*. Using the cast as a pattern, have a brass armor hammered to fit it, making it wide on each side, somewhat narrower behind, and still narrower in front, so that the the thighs may not press against the lower edge when flexed. This armor opens by hinges situated a little external to the sacro-iliac junctions and locks in front on the *linea alba*. It is, therefore, composed of three pieces; and, when clasped upon the patient, will be found to fit the hips nicely, and to bear any amount of downward pressure,

without causing pain. It should be lined with cotton flannel. In children in whom the hips are usually narrow, it is commonly necessary to modify this by making the side pieces in such a form as to cap over more decidedly the crests of the ilia. A steel rod arises from the centre of the back of the armor and another from the front, each coming well up to the height of the shoulders. Their upper extremities are cut for eight inches into a screw, and carry an octagonal nut. A short and strong jacket of leather must be made to fit the chest snugly, and fastened at the top to the circumference of a steel ring which surrounds the neck. This ring has sockets before and behind, which slide down upon the screws to a distance regulated by the nuts. A cross arm before and behind may be used instead of the ring. If now the two nuts be screwed upward the ring will be raised and by the tension upon the jacket the weight of the upper half of the body may be entirely taken off from the spinal column and borne by the steel rods directly upon the armor of the hips. The source of irritation being thus removed, the inflammation will, in many instances, subside spontaneously without any other treatment. At the same time, the spinal column is drawn straight, exactly as if it were a string. The jacket may be advantageously lined with adhesive plaster in some cases. If the seat of the disease is not above the middle of the dorsum, the very excellent corset of serpentine wire, devised by Dr. Wood, is often the best appliance.

A simpler apparatus will accomplish the end desired in cases which are not in

flammatory, because, in such it is not necessary to take off the weight of the trunk, but only to straighten it. Where a non-inflammatory curvature is lateral, which it usually is, I advise the instrument shown in Fig. 2. This consists of a

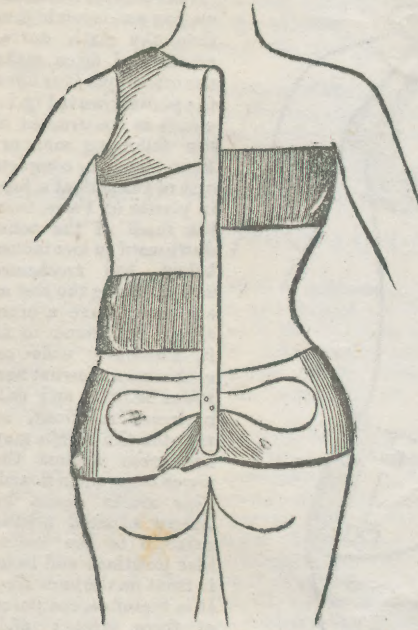


Fig. 2. Instrument for Double Lateral Curvature without inflammation.

wide band of leather, fitted closely to the form of the hips, enclosing a large brass plate in the back and another in the front. From each of these plates rises a flat steel rod to the height of the seventh cervical vertebra behind, and of the top of the sternum in front.

A half jacket connects the summits of the two rods passing around the shoulder on the same side as the concavity of the upper curvature. A broad "band" passes around the opposite side lower down, so as to press firmly upon the convexity of the upper curve. On the opposite side from this, still lower down passes a second band which presses upon the convexity of the lower curve. Both should buckle to the front rod in such a way as to allow of strong tightening. This apparatus is extremely light, simple and efficient. When desirable, the principle of Fig. 1 and Fig. 2 may be combined, by attaching the bands to the rods of the former. I formerly used "elastic" for the bands, but in practice the want of durability has proved so great an objection to that material that I now have them made of leather.

In difficult cases of lateral curvature the use of a supporter is not sufficient. Certain specific exercises must be resorted to in order to *develop a greater power those of the spinal muscles which lie along the convexities of the curve* and thus cause them to draw the spine into a correct form. For this purpose I have devised the chair of which Fig. 3 is a sectional view, and which must be constructed expressly for the patient so that it will fit his form. If, as usual, the convexity of the lower curve is to the left, and of the upper to the right, then the left arm of the chair must be stuffed so as to press upon the bulge of the lower curve just above the crest of the ilium. From the top of the right hand arm of the chair rises a strong iron bar carrying a broad pad hollowed to fit the side, and of such a height as to press upon the convexity of the upper curve. The pad must project far enough to the left, so that, when the patient sits down in the chair, the body will be forced strongly over to the left, in the position shown by the dotted outline. Then let her without any help from her hands, but solely by the muscles of the trunk flex her body strongly and suddenly to the right across the right hand pad, as shown in the engraving, endeavouring to carry the motion far enough to actually reverse the curvature for the moment and make it assume a direction opposite to what it had originally. This motion should be repeated from ten to twenty-five times successively, and then, after a few minutes rest, the same succession gone over again. Fifty motions will suffice for the first sitting. There should be four sittings a day, and the number of motions at each be increased to a number varying from 200 to 800 according to the vigor of patient. This has a powerful effect in all cases which are capable of muscular action. If the curvature is on the opposite direction the chair must be made with reversed sides. The outline in Fig. 3 and 4



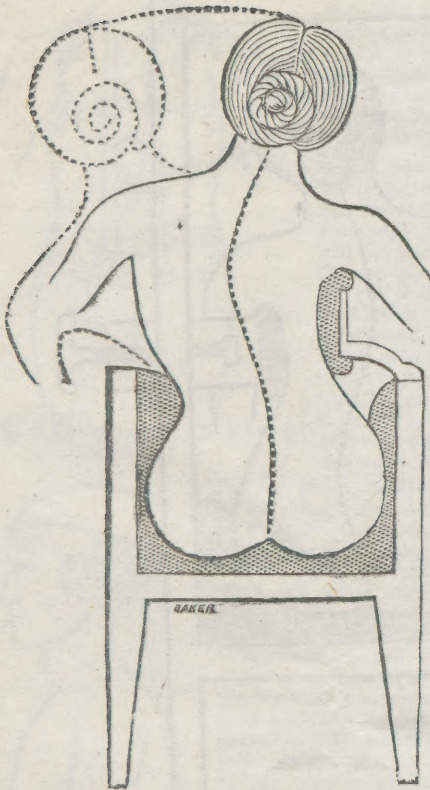


Fig 3. Chair for exercising the deficient muscles of the spine.

enclosing the hips, shaped like those of trusses and attached to a brass cuirass in front, which distributes their pressure upon the lower half of the abdomen, and the front of the pelvis. From the back of the spring rise two strong elastic steel straps, set wide enough asunder to avoid pressing on the bony prominences of the deformity, and to make pressure upon the common mass of the *erector spinae* muscles on either side. The top is surmounted by a pair of elastic shoulder-braces, by which the spine is drawn back to the steel supports and thus made straight.

Unfortunately, many of the patients with angular curvature are already fatally exhausted by caries before they see the surgeon, and cannot, in that state, tolerate the annoyance of any apparatus whatever; but, if seen in time, some proper supporter should be promptly applied. The opinion advanced by many writers, that the spinal column should be allowed to fall forward, so as to favor anchylosis, is delusive. The periosteum will produce new bone for anchylosis quite as well in the erect position as in the crooked, besides the falling forward keeps up the pressure, extends the caries, and insures deformity.

If the deformity to be treated is in the neck or the upper fourth of the dorsum,

are represented without the clothing, merely to show more clearly the action of the machine. In practice, of course, the patient should wear the ordinary dress. Very obstinate cases require the apparatus represented by Fig. 4. It consists of a strong frame with a cushioned seat. On either side there is a large concave pad, one of which presses against the convexity of the lower curvature, and the other against that of the upper. A concave cushion also supports the shoulder opposite the upper part. The patient being seated in the chair, the pads are advanced against the convexities of the curves by means of screws, until they are pressed in and become concavities, thus reversing the deformity. The patient should remain in the apparatus from 15 minutes to an hour three times a day. The use of the apparatus shown in Fig. 3 must not be omitted on account of the sittings in this. When the distortion is backwards, an entirely different instrument is required. If inflammation still exists, apparatus No. 1 should be applied, but if that stage is past and the deformity alone is to be treated, it can be admirably managed by the principle represented in Fig. 5. It consists of a steel spring

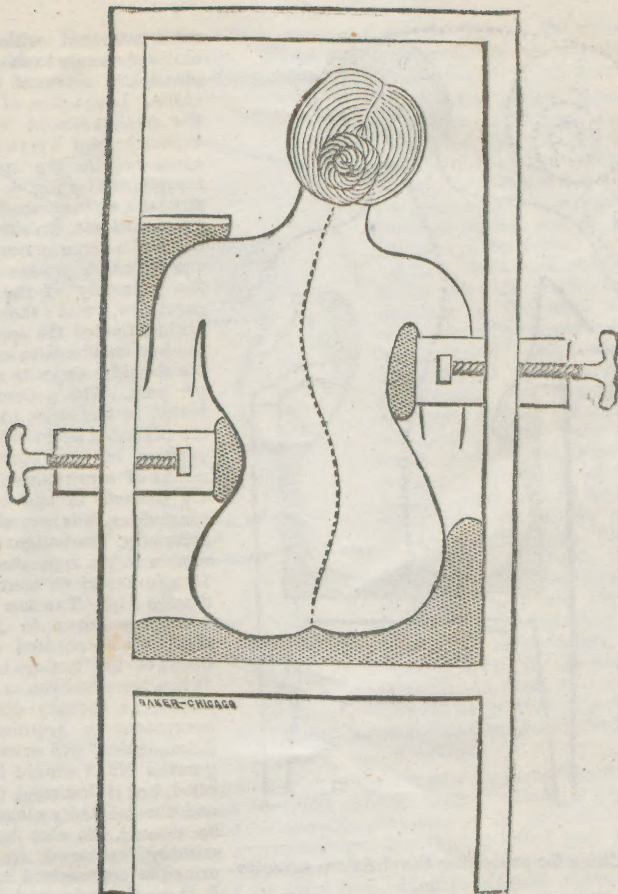


FIGURE 4.

the before - mentioned instruments will not answer the purpose, as they do not reach high enough. In such cases it is necessary to apply the extension power to the head. For this purpose, an excellent splint may be made on the plan shown in Fig. 6. In this case we require the hip armor as in Fig. 1. From the back of this rises a steel rod to the middle of the neck, the last ten inches being in the form of a tube. In this tube slides a screw to a depth regulated by the nut upon it. The top of the screw carries a brass headpiece, hammered to a concavity to fit accurately the whole occipital region as far forward as the ears. The hollow must be lined with some soft substance, and the head kept firmly in it by a band passing around the forehead. Extension is made by turning the nut so as to cause the screw and head-piece to rise. In this way, the cervical part of the spinal column is put on stretch. The patient will in these cases also require a "stretch bed" as described below, as the extreme difficulty of head extension renders this supporter less efficient than those used for lower curves.



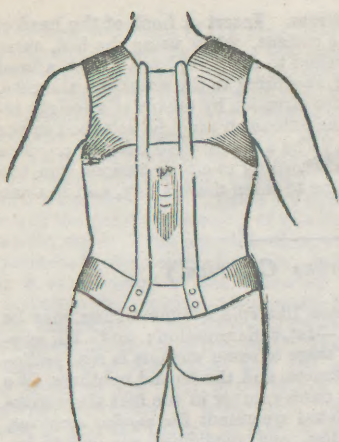


Fig. 5. Instrument for Backward Curvature.

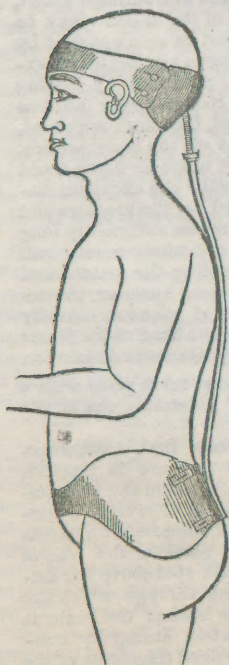


Fig. 6. Head Extension for High Curvatures.

In adopting this treatment, the surgeon must not expect to buy his instruments ready made, and order them put on without trouble to himself. The ready made apparatus sometimes offered for sale for spinal disease always proves a miserable failure, owing to its total want of adaptation to the form of the patient.

The case should first be thoroughly investigated to ascertain what is needed. The form must then be carefully measured, and parts of it often copied in plaster of Paris, and the instrument constructed to fit under the explicit directions of the surgeon. When put on, it must not be at first screwed and buckled to the utmost tension expected to be attained, but worn lightly and easily until the skin and other parts become accustomed to its pressure. Then it may gradually be made to draw more and more until it accomplishes its purpose. Even old cases of deformity, of years standing, may thus be greatly improved and often entirely cured.

The fact that the bodies of the vertebrae and the intervertebral cartilages have changed their form and become wedge-shaped, does not by any means condemn the patient to a lifelong deformity. The same agent, pressure, which, improperly applied, produced distortion, will, when correctly used, restore the original shape. Under the new influence, the thick sides of the bodies of the vertebrae receive the whole pressure, or, if extension is used, the shortened ligaments receive the whole tension; and, by a general law of the system, the corrected position at length becomes permanent. In some instances, the spinal column must be kept a little curved over for a time in the direction opposite to that of the deformity. The thicker borders of the vertebrae and cartilages will thus receive the entire pressure and be thinned by absorption, while the thinner sides, relieved from it, will grow thicker. In this way the forms may be quite restored. Very great perseverance and patience will be required, however, in most cases of spinal disease.

#### THE STRETCH BED.

The Orthopedists of Germany make use of an excellent apparatus which they term the "Stretch Bed", but which has rarely been tried by American surgeons. In many cases it is not sufficient that the patient be under corrective treatment when sitting or walking. They should also be under curative influence when lying down. For this purpose the Stretch Bed should be prepared. This apparatus is variously constructed. In case of patient's remaining at home this may be extemporized in the following

manner: Take an ordinary bedstead and mattress. Insert a hook at the head of the bed, and a screw pulley at the foot. The patient, when using the bed, must have the head or upper part of the body attached to the hook by a jacket, a head piece or by some other contrivance, varied according to the nature of the case. Extension must then be made in the opposite direction by means of a weight attached to a cord running over the pulley. The extension must be attached to the body by means of adhesive straps on the legs, or by a belt around the waist. The weight should be from five to fifty pounds according to circumstances, and the patient should go into the stretch bed, from one to three times a day, and in some cases sleep in it.

### HIP DISEASE, (*Morbus Coxarius*.)

For the purposes of this article, hip-disease, like spinal inflammation, may be described as passing through two stages, viz. —1st, inflammation; and 2d, supuration and caries. The brief intermediate stage of some authors is not, pathologically, separable from the first, in some instances, and the second in others. We observe in this, as in spinal disease, that many cases recover in the first stage without ever proceeding to caries. The constitutional treatment for *morbus coxarius*, consists in the free employment of regimen, diet, and medicines adapted to increase the plasticity of the blood, exactly as was detailed above spinal inflammation, bearing always in mind that *if plasticity is kept up, caries will not occur*.

The local treatment consists, in the first stage, in the use of a suitable splint, by means of which the weight of the body and the tension of the muscles may be completely taken off from the inflamed joint. This must be accomplished by such means as will allow the patient to go about and preserve his health by exercise. The disastrous effect of the pressure and friction, produced by bearing the weight of the body upon the diseased joint, may be rendered very obvious by a few remarks. The synovial membrane, when inflamed, becomes roughened, yet upon this inflamed and rough surface the entire weight of the body presses, rubs, and grinds at every step. Of course, under such harsh usage no tissue could be expected to recover without serious mischief, and especially the exquisite machinery of a joint. The disease, therefore, being aggravated by the pressure and friction, grows daily worse, and seldom finds an interval of repose sufficiently long to permit a recovery. Hence, sooner or later, caries very commonly occurs, and abscess forms, and long and copious supuration ensues, lasting for months and years, until the patient is exhausted and dies. In some cases, however, the endurance of the patient is so great that the carious portions of bone are actually worn to sand and washed away with the pus. In this way the head of the femur and the walls of the acetabulum may be removed, and spontaneous dislocation

occur, after which, recovery takes place with a deformed hip. Figure 7 illustrates one of the cases which I resected.

The part where the disease first commences is, naturally, where the pressure is greatest, viz. :—at the top of the acetabulum and the summit of the head of the femur. The shaded portion represents a mass of necrosed fragments which had been originally parts of the wall of the acetabulum. The black spot above is a fistulous channel in the bone through which the pus made its escape. The head of the femur is seen roughened and worn to a stump by constant attrition against the dead fragments of the bone. After the removal of the diseased bone, the patient recovered rapidly, and now walks on the limb with ease,—a ligamentous attachment of the femur to the pelvis supplying the place of the lost joint.



Fig. 7. Sectional View of a case of Hip-Disease.



The local treatment of the hip-disease, in the first or inflammatory stage, consists in the application of some suitable instrument, by which the weight of the body and the tension of the muscles can be entirely taken off from the joint, so that the inflamed surfaces no longer press and rub against each other. Dr. H. G. DAVIS, of New York, was the first to construct an efficient apparatus for this purpose, and with it he has accomplished many excellent cures. There are some defects, however, in the practical working of this instrument, which have led me to devise a modification, which, after much experience in these cases, I prefer. It is represented in Fig. 8, and consists of the following parts:— 1st, an iron crutch-piece modelled accurately to fit the perineum and nates. The engraving conveys an erroneous idea about the shape of this part. The principal curve is lateral, so as to embrace half the circumference of the thigh at the level of the fold of the nates. The posterior extremity is broad and hollowed to fit the nates, so that the patient, as it were, sits upon it. It is cushioned and covered with enamelled cloth or patent leather, to resist the moisture of the perspiration. The crutch piece thus made is supported upon the summit of a strong screw, twelve inches in length, upon which turns a nut. The screw slides into a tube, and this again terminates at its lower extremity in a rod which runs down along the inner side of the leg to the ground, and, by a cross-piece, rivets firmly to the sole of a stout shoe. The top of the shoe carries a light buckle on either side for the purpose hereafter mentioned.

In female patients the instrument is somewhat in the way of the urinary organ, and therefore I apply it to the outer side of the limb, supporting the body by a perineal band attached to the upper end of the screw.

The instrument is applied to the patient as follows:— Place it on the inner side of the limb, in such a position that the crutch-piece will press upward against the perineum, the broad end being backwards. The concave edge will now embrace about half the circumference of the thigh, and the perineum and nates will rest easily in the hollow of the upper surface. Buckle the attached strap lightly around the outer side of the thigh. Next cut two adhesive-straps, each two feet in length, and three inches wide at the one end, and one at the other, apply these on each side of the limb, broad end upwards, and confine them by winding spiral straps over them as in adhesive-strap extension for fractures. Place the foot in the shoe, and the lower ends of the adhesive-straps in the buckles at the top of it. Tighten the straps in the buckles until the foot rests firmly in the bottom of the shoe. Next extend the screw, by turning the nut, until the crutch-piece rests firmly against the perineum, and until the patient, in walking, bears all his weight on the instrument and *none of it* on the hip-joint. This can be ascertained by seeing if the adhesive-straps are still tense when the weight of the body is thrown upon the instrument. The patient may then be allowed to walk about as much as he pleases, preserving his general health by exercise. He will not require any crutches. In the use of this instrument, the patient is soon conscious of great relief. Even little children discover in a few days that it greatly relieves their pain, and insist on keeping it on. It should be worn nights as well as daytimes, except in the milder cases. From the hour of its application, the patient generally begins to improve, and by degrees is perfectly cured. He should wear the splint from six months to two years. The cost of the instrument is \$15.

In cases where the thigh has been drawn up at a right angle with the body, by



the contraction of the flexors, it is sometimes necessary to divide the tendons and bring down the limb before the splint can be usefully worn.

The second stage of hip-disease is that of caries. When this has occurred, a

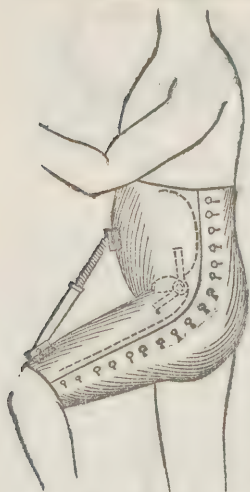


Fig. 9. Apparatus for Straightening Flexed Hips.

recovery by simple subsidence of inflammation is no longer possible. The dead bone must be extruded by nature or removed by the surgeon. Great fear was formerly felt of undertaking an operation for this purpose, and the books which condemn it are still standard works. There is, however, no part of the body whatever more benefited by the removal of carious bone than the hip-joint. The operation should be resorted to in all cases where the patient seems likely to sink from the exhaustive suppuration, as also in cases, which after years waiting, show no disposition to heal. It is best performed by a single straight incision along the trochanter major, through which the head of the femur may be turned out and sawed off. If the ilium is carious, it must be freely and unhesitatingly trimmed with the gauge until all dead portions are removed.

After the operation, as before, the splint must be worn to keep the limb from shortening, until the femur has had time to contract a ligamentous adhesion to the ilium.

We often meet old cases of hip-disease, in which the carious bone has already been removed by exfoliation, and the ulcerations have healed up; or, perhaps, the inflammation has subsided without producing caries, but, in which the thigh has become stiffened in the flexed condition, so that the foot cannot be brought down to the ground. In these cases, the hip-disease proper is already cured, and we have only to deal with the deformity, and if we succeed in rectifying that, so as to bring the foot to the ground, we shall give the patient a useful limb.

For this purpose, I employ the apparatus shown in Fig. 9. It consists of a pair of strong close-fitting drawers, made of double brown drilling, and extending from the top of the abdomen to the knee. Enclosed in this is a brass coriass fitted to the front of the abdomen and pelvis, and a brass armor covering the front half of the thigh. The top of the thigh-piece is solidly hinged to the lower edge of the coriass. From one piece to the other passes an extension-brace, which, when the screw is turned, slowly pushes down the thigh and corrects the deformity. A slight additional extension should be made every day until the object is accomplished. The cost of the instrument is \$10.

## KNEE-JOINT DISEASE.

The knee-joint is subject to precisely the same inflammatory and carious affections as the hip and the spine. The only notable difference in their history is, that hip-disease is limited almost exclusively to children, while spinal and knee-diseases occur at every age. The pathology of knee-disease is identical with that of the hip, and the tendency of carious spots, in one of the bones, to produce caries in the corresponding spot of the bone which rests upon it, is still more obvious than in the hip. Fig. 10 is a vertical plan of a knee-joint which I removed by the operation of resection; and the shaded portions represent the dead part of the bone. It is curious to note how exactly each sequestrum is matched by another of the same size and position, facing it from the opposite surface of the joint. The two sequestra in the femur were, probably first formed, and by the constant irritation which they kept up, they caused the death of those spots in the patella and tibia which rested upon them. It is noteworthy also that the disease has occurred





Fig. 10. Vertical Section of a Knee-Joint, showing that Necrosis in one surface causes Necrosis in the surface in contact with it.

### ANCHYLOSIS OF THE KNEE.

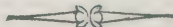
This condition results from inflammation, in consequence of which plastic lymph is effused upon the articular surfaces, causing them to adhere firmly together and prevent all motion. In a few cases, the cartilages are removed by ulceration, and a bony union is formed. Practically, the bony form is rarely found, ninety-nine cases out of a hundred being of the fibrous variety. During the inflammatory stage, the patient seeks a partial relief of his pain by placing the limb in a flexed position; hence, we usually find the knee not only stiff, but flexed at an angle.

There are two objects, therefore, to be gained by the treatment: first, to straighten the limb so that the foot may be brought to the ground; and, secondly, to restore the mobility of the joint. The resistance to the straightening process, in fibrous ankylosis, is maintained by three tissues, viz.: the flexor, muscles, and tendons, the shortened ligaments, and the new fibrous tissue connecting the inner faces of the joint to each other. All these obstacles will yield to steady tension; and, if the patient and surgeon think best, the limb may be perfectly straightened without any operative procedure.

In all the more difficult cases, however, the flexor tendons oppose so much resistance that it is, practically, much the best to divide them at the outset with a tenotome. We have then simply to overcome the resistance of the shortened ligaments and of the new tissue in the anterior of the joint. For this purpose, extend the leg until the tendons of the hamstrings are quite tense, and then divide them, taking care to avoid the peroneal nerve by the tendon of the biceps. The patient should be well under the influence of an anæsthetic; and, after the tendons are

exactly at the two points which are subjected to the greatest pressure in the use of the limb.

I have introduced this engraving for the express purpose of showing the injurious effects of pressure, and of impressing upon the reader the importance of removing that cause of evil by suitable extension splints. The treatment, therefore, is identical with that of hip-disease, and the same instrument, (see Fig. 8,) is required. The uniform conclusion, from the best experience is, that this treatment, applied in the first stage, is even more successful in the knee than in the hip. If, however, the case has already proceeded to the stage of caries, the splint is no longer applicable. There should then be an early resort to resection or amputation, before the patient is worn out by suppuration and pain.



severed, moderate efforts may be made to straighten the limb by force. Great violence, however, should not be used, as serious and fatal results have followed such a course. If the adhesions refuse to yield to a moderate force suddenly applied, we must next resort to gradual extension.

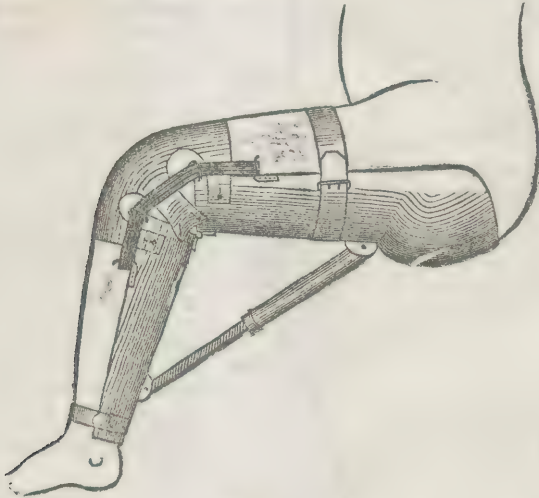


Fig. 11.

For this purpose, I use the instrument shown in Fig. 11. This consists of a half-armor, covering the posterior portion of the limb and extending from the ankle to the middle of the nates. An extension - brace, formed by a tube and a screw, passes across the angle, for the purpose of applying a powerful force in obstinate cases; but, in more tractable limbs, the brace is removed, and the force obtained by means of the strong rubber springs on either side of the knee, attached to the upper edges of the apparatus. The knee must be kept in by a cloth knee-cap firmly strapped down, and the leg and thigh bound in by a band or two of cloth or adhesive-straps. The principle of this splint has been in use a long time, but one or two points are new. The prolongation of the thigh piece upward upon the nates is to get a firm bearing upon the ischium so as to avoid pressing the upper end upon the sciatic nerve, which is apt to occur in the old form figured in the text-books. Care must be taken that the edge of the instrument on the outer border of the knee does not press upon the peroneal nerve and paralyze the dorsum of the foot. If the brace is used for extension, the nut must be tightened a little three or four times a day, until the joint is quite straight. In milder cases, the brace may be removed and rubber springs left to work alone, simply being tightened a little once in three or four days. The best material for construction is sheet-brass; but, if preferred, ordinary sheet tin will answer, and a common tinner can construct every part of it, except the nut, screw, and rubber springs.

The straightening may be accomplished commonly within two months, meanwhile daily motions of extension and flexion should be made as diligently as the sensitiveness of the joint will permit, in order to restore the mobility. This restoration of the power of motion is a slower and more tedious process than the mere straightening; but, nevertheless, if the passive exercise is continued long enough, the result is tolerably certain in favorable cases. If the ankylosis is bony, the straightening is still possible in the same way as before; but, practically, the difficulties are so great that operative interference is preferable. A wedge-shaped piece of bone may be removed in such instances, and the leg then brought down.



TALIPES, (*Club foot.*)

The improvements in mechanical surgery have so much diminished the necessity of tenotomy, that some surgeons have almost ceased to cut tendons in club feet, it being found that the contracted parts will always yield to steady tension properly applied.

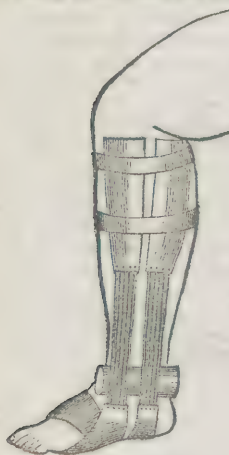


Fig. 12.

The fundamental maxim in these cases is this: *Every distorted Joint may be made to return to its normal position by steady and long continued traction.* The principle of the management of talipes without tenotomy is, therefore, very simple; but the successful application of it depends upon the patience, faithfulness, and ingenuity of the surgeon. There are also a few instances where the practical difficulties render the principle inapplicable. And in such the section of the *Tendo Achillis* will still be found the best plan. The appliances must be prepared by the surgeon for each particular patient, and varied to suit the particularities of the case; and the materials for them consist mainly of adhesive plaster and elastic webbing. The following description may serve to convey the general idea. We will suppose it to be a case of talipes varus. The first thing to be done is to secure two firm points of traction, which will not hurt the patient. For the first, we envelope the foot in bands of adhesive-plaster, carefully adjusted, bringing their free ends under the sole and up the outer side. The second point of tension is

easily made by attaching broad adhesive-straps to the upper part of the outer side of the leg. It is convenient to arm the lower extremities of these with light buckles. The upper and lower adhesive-straps are now connected by from one to three strips of elastic webbing, which, of course, pass over the outer malleolus and tend to draw the foot to its position. A small cushion should be placed upon the malleolar region to receive the pressure of the bands. Thus prepared, let the elastics be buckled to a very gentle tension for the first few days, until the skin becomes accustomed to the presence of the apparatus, after which they may be gradually tightened. The tension being moderately kept up day and night occasions very little pain, and the contracted parts slowly yield until the foot assumes a perfect position. Many weeks are often consumed in the treatment; but if the parents are intelligent, the surgeon need not see the child very often after the first twelve days.

The engraver has, in the above cut, misrepresented the malleolar cushion, causing it to look like a roller of solid wood. Of course, no one will be misled by the error. A good club-foot shoe can be made to accomplish the cure, but not so easily as the elastic bands. A very efficient application may be made to club-feet by means of the *gutta percha* casing to the foot by Dr. Prince.

## BOW-LEGS.

One of the most difficult and vexatious deformities ever brought up for treatment is bow-legs. It is caused by rickets, in some instances, and in others by too early efforts of the child to walk, by which the tibia is flexed with the convexity outward, and the whole limb assumes a bow form. The principal curvature is usually at the point where the upper part of the tibia joins the epiphysis. There is often a slight degree of this deformity in young children, which disappears without treatment before the child reaches the fourth year of its age; but in more aggravated cases, it continues and constitutes a permanent blemish. After a variety of troublesome experiments, I have devised the apparatus represented in

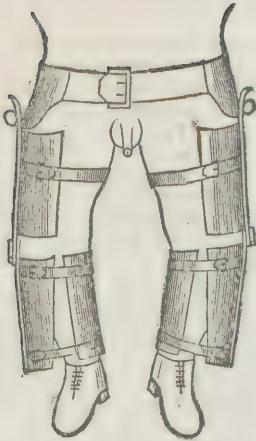


Fig. 13.

Fig. 13, which answers the purpose perfectly. A spring-steel band passes partly around the waist being left open in front where the vacancy is filled by straps and a buckle. On each side a projection of the steel extends downward until it overlaps the trochanter major. To each projection a steel strap is articulated, extending downward to the knee, and carrying an armor which embraces the outer half of the thigh. At the knee another strap articulates with a similar half-armor for the outer side of the leg. A narrow piece of armor is also made to fit the inner side of the leg. The joints of the instrument must be made to come accurately opposite the hip and knee joints; and those opposite the knee, while they move easily backward and forward, must firmly resist any lateral flexion. For this purpose the rivet must have a broad, strong head. The whole must be nicely covered and padded. If now the band is buckled around the waist and another be passed around the middle of each thigh, it will be found that while the limb applies very well, as far down as the knee, it there leaves the armor and curves inward. The proper pieces must now be placed along the inner side of the leg, and, by

means of straps and buckles, be drawn outward towards the outside pieces. The spring of the steel keeps up a constant elastic tension; and by daily tightening the straps, the limb will be slowly brought back to a perfect form.

Care must be taken not to apply the straps too tightly at first, otherwise the skin will abrade and ulcerate, and the whole treatment be delayed. It will be sufficient if, during the first ten days, the instrument be worn very lightly, — just pressing enough to accustom the skin to its presence, after which, it can be made to draw more powerfully, until the object in view is accomplished.











